

CLAIMS

What is claimed is:

1. 1. A polymer system comprising amide linkages with hetero-atoms positioned beta relative to nitrogen atoms forming the amide linkages.
2. 2. The polymer system of claim 1, wherein the amide linkages link one or more of aromatic structures and heterocyclic structures.
1. 3. The polymer system of claim 2, wherein the hetero-atoms are nitrogen.
2. 4. The polymer system of claim 2, wherein the heterocyclic structures comprise an alcohol functional group that is positioned beta to at least a portion of the amide linkages.
1. 5. The polymer system of claim 2, wherein the aromatic structures comprise one or more function groups positioned beta relative to at least a portion of the amide linkages, the one or more functional group being selected from a group consisting of an alcohol functional group, a thiol functional group and an amine functional group.
2. 6. The polymer system of claim 2, wherein aromatic structures include bicyclic sub-structures.
1. 7. The polymer system of claim 1, further comprising a binder material.
2. 8. The polymer system of claim 7, wherein the binder material comprises one or more materials selected from a group consisting of epoxy, rubber, plastic, polyurethane and silicone.

5 9. The polymer system of claim 2, wherein the amide linkages are positioned para between  
6 the aromatic structures and the heterocyclic structures.

1 10. A polymer comprising amide linkages between aromatic structures and heterocyclic  
2 structures, wherein the heterocyclic structures comprise hetero-atoms positioned beta  
3 relative to a nitrogen of the amide linkages.

1 11. The polymer of claim 10, further comprising alcohol groups positioned para to the amide  
2 linkages on at least one of the aromatic structures and heterocyclic structures.

1 12. The polymer of claim 10, wherein hetero-atoms include nitrogen atoms.

1 13. The polymer of claim 12, wherein the nitrogen atoms are positioned beta relative the  
2 nitrogen of the amide linkages.

1 14. The polymer of claim 10, wherein the aromatic structures and the heterocyclic structures  
2 are linked in a para configuration between the amide linkages.

1 15. The polymer of claim 10, further comprising hydroxyl groups.

1 16. The polymer of claim 15, wherein the hydroxyl groups are positioned beta with respect to  
2 the amide linkages on at least one of the aromatic structures and the heterocyclic  
3 structures.

1 17. A method for making a polymer system comprising:  
2 a) reacting a carboxylic acid precursor and an amine precursor in a suitable solvent  
3 to form an aromatic polyamide, wherein the carboxylic acid precursor comprises  
4 an aromatic structure and two reactive carboxylic acid groups and the amine

5 precursor comprises a heterocyclic structure and two reactive amine groups and  
6 wherein the heterocyclic structure comprises a hetero-atom in a beta position  
7 relative to one or more of the reactive amine groups; and  
8 b) isolating the aromatic polyamide.

1 18. The method of claim 17, wherein the hetero-atom is a nitrogen.

1 19. The method of claim 17, wherein the aromatic carboxylic acid precursor comprises a  
2 functional group positioned beta to one or more the reactive carboxylic acid groups,  
3 wherein the one or more functional groups are selected from a group consisting of an  
4 alcohol functional group, a thiol functional group and an amine functional group.

1 20. The method of claim 17, wherein the heterocyclic amine precursor comprises a functional  
2 group positioned beta to the one or more of the reactive amine groups, wherein the  
3 functional group is selected from a group consisting of an alcohol functional group, a  
4 thiol functional group and an amine functional group.

1 21. The method of claim 17, wherein the two reactive carboxylic acid groups are positioned  
2 para to each other on the aromatic structure.

1 22. The method of claim 17, wherein the reactive amine groups are positioned para relative  
2 to each other on the heterocyclic structure.

1 23. The method of claim 17, further comprising incorporating the aromatic polyamide in a  
2 binder material.

1 24. The method of claim 23, wherein the binder material is selected from a group consisting  
2 of epoxy, rubber, plastic, polyurethane and silicone.

- 1 25. The method of claim 17, further comprising integrating the aromatic polyamide into a
- 2 fabric material.
  
- 1 26. A method of making an aromatic polyamide comprising:
  - 2 a) combining a first precursor with a second precursor to form the aromatic
  - 3 polyamide, wherein the first precursor comprises two reactive carboxylic acid
  - 4 groups bonded to an aromatic structure and the second precursor comprises two
  - 5 reactive amine groups bonded to a heterocyclic structure; and
  - 6 b) isolating the aromatic polyamide.
  
- 1 27. The method of claim 26, further comprising combining a third precursor with the first
- 2 precursor and the second precursor, wherein the third precursor comprises two reactive
- 3 carboxylic acid groups bonded to an aromatic structure that is different from the aromatic
- 4 structure of first precursor.
  
- 1 28. The method of claim 26, further comprising combining a third precursor with the first
- 2 precursor and the second precursor, wherein the third precursor comprises two reactive
- 3 amine groups bonded to a heterocyclic structure that is different from the heterocyclic
- 4 structure of the second precursor.
  
- 1 29. The method of claim 26, wherein the heterocyclic structure of the second precursor
- 2 comprises a nitrogen atom positioned beta to at least one of the reactive amine groups.
  
- 1 30. The method of claim 29, wherein the heterocyclic structure of the second precursor
- 2 comprises an alcohol functional group.

- 1 31. The method of claim 30, wherein the alcohol functional group is positioned beta to at
- 2 least one of the reactive amine groups.
  
- 1 32. The method of claim 26, wherein the aromatic structure comprises an alcohol functional
- 2 group.
  
- 1 33. The method of claim 32, wherein the alcohol functional group is positioned beta to at
- 2 least one of the reactive carboxylic acid groups.